

Gas House Autonomous System Monitoring (GHASM)

Completed Technology Project (2014 - 2016)



Project Introduction

This project involves the development of an autonomous monitoring system capable of assessing the condition of every element in the system, continuously and comprehensively. The Gas House Autonomous System Monitoring (GHASM) will be an intelligent knowledge system making inferences and conclusions on the state of system elements i.e., sensors, valves. Knowledge will be integrated across elements and subsystems to implement functional capabilities of an Integrated System Health Management (ISHM). These capabilities include (1) anomaly detection, (2) diagnostics, (3) prognostics, and (4) user interfaces to provide the operator with an integrated awareness about the system's health.

The GHASM Project's objective is to implement a knowledge-based capability that autonomously monitors and captures anomalies in the system. The implementation is targeted for the new hydrogen system within the High Pressure Gas Facility (HPGF) or Gas House at NASA's Stennis Space Center (SSC). The technology has been evolving for approximately 8 years at SSC. It consists of a software toolkit built using the Commercial off-the-shelf (COTS) Gensym G2 software platform. In the past 3 years, the technology has been validated at KSC's Cryogenic Testbed Laboratory. This will be the first implementation on an operational system.

Anticipated Benefits

This technology is being used in the project, Autonomous Propellant Loading, which is funded by Advanced Exploration Systems. It is expected to potentially benefit Space Launch System (SLS) as well as activities associated with the Mars mission for In-Situ Resource Utilization and a Mars settlement.

Autonomous monitoring and control capabilities may be used to operate any system. It is particularly desirable to operate complex systems and remote systems where it is difficult and costly to rely on operation by people. NASA ground, aeronautic, and space systems can benefit from this technology. The benefits include: (1) increase in safety with ISHM functionality – continuous and comprehensive monitoring, (2) decrease in operating costs through autonomy, and (3) enabling missions where systems are operated remotely – e.g. robotic and planetary missions.

Any industry or government agency with these types of systems will benefit from this technology. It could be applied to for example, launch systems, test systems, and spacecraft.



Technology Transfer Logo

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Primary U.S. Work Locations and Key Partners

Organizations Performing Work	Role	Type	Location
★ Stennis Space Center(SSC)	Lead Organization	NASA Center	Stennis Space Center, Mississippi
● Exploration Capabilities	Supporting Organization	NASA Program	
● Kennedy Space Center(KSC)	Supporting Organization	NASA Center	Kennedy Space Center, Florida

Co-Funding Partners	Type	Location
General Atomics	Industry	

Primary U.S. Work Locations	
Florida	Mississippi

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Stennis Space Center (SSC)

Responsible Program:

Center Innovation Fund: SSC CIF

Project Management

Program Director:

Michael R Lapointe

Program Manager:

Ramona E Travis

Project Manager:

Fernando Figueroa

Principal Investigator:

Fernando Figueroa

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Images



Gas House Autonomous System Monitoring (GHASM)

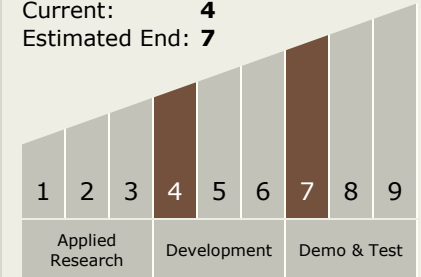
Technology Transfer Logo
(<https://techport.nasa.gov/image/16539>)

Stories

Autonomous Control for Rocket Launch Systems
(<https://techport.nasa.gov/file/21924>)

Technology Maturity (TRL)

Start: 4
Current: 4
Estimated End: 7



Technology Areas

Primary:

- TX13 Ground, Test, and Surface Systems
 - TX13.1 Infrastructure Optimization
 - TX13.1.4 Propellant Production, Storage and Transfer

Target Destination

Earth